SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS
AND
SUNY-BUFFALO

Using Performance Indicators to Monitoring Growth Vision Progress in Transit-Oriented Communities

Frank Wen, Simon Choi, Hsi-Hwa Hu, Cheol-Ho Lee,
Sung Ho Ryu, SeongHee Min, Jung H. Seo, and JiYoung Park

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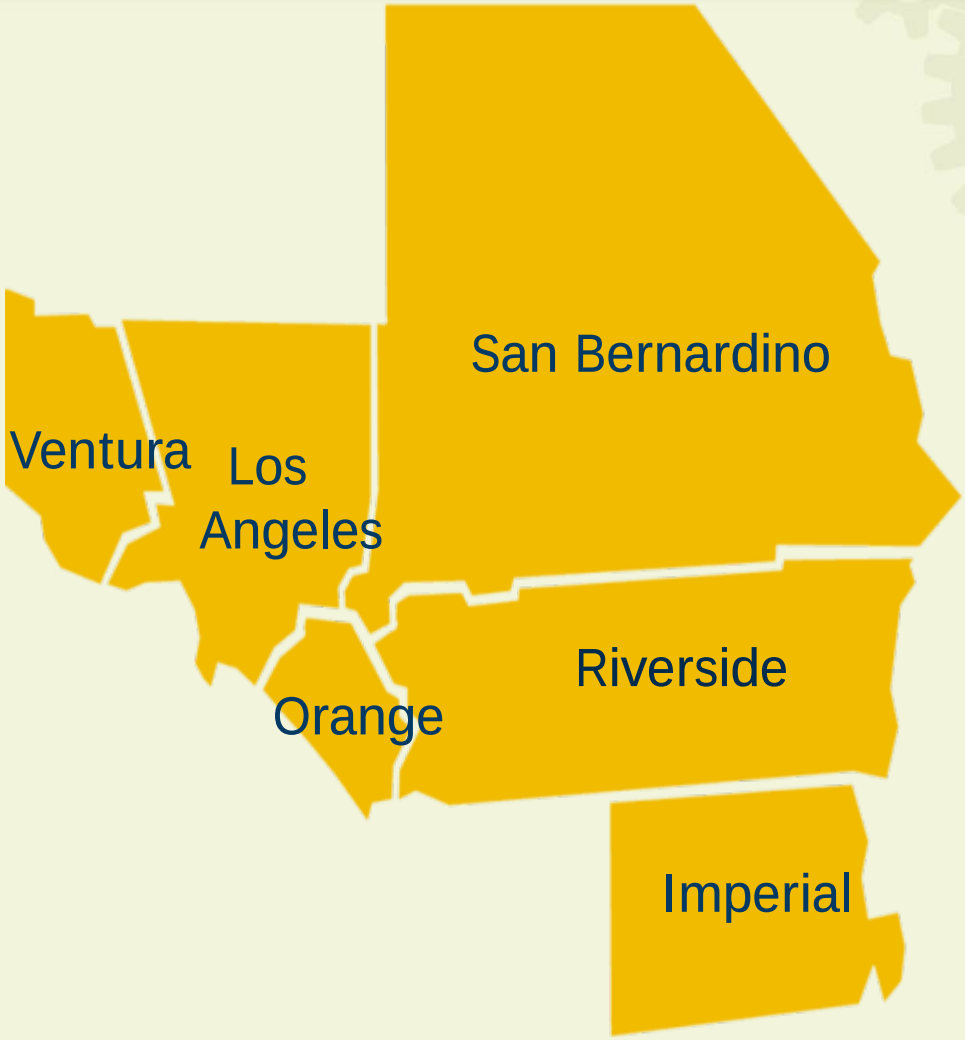
Southern California Association of Governments (SCAG)

SCAG Quick Facts



- Nation's largest Metropolitan Planning Organization (MPO)
- 6 counties, 191 cities and 38,000 square miles.
- 18 million people (5.8% of US population; 48.5% of California population)
- GRP in 2010: $910 Billion, 16th largest economy in the world
- 10,000 lane miles of freeway; 4 major airports; Nation's global gateway for trade

Background
Visioning Process

- Visioning process is used by regional planners to develop regional land use/transportation scenarios.
  - Visioning is a highly community oriented planning technique used to create regional land use and transportation goals (FHWA 1996).
  - It involved gathering of participants and stakeholders to form a consensus vision (Barbour and Teitz, 2006)
  - It was used to identify preferred types of development and growth pattern (Berke, Godschalk, and Kaiser, 2006)

SCAG Growth Vision Program

- To respond the challenges of future land use and transportation development, the Southern California Association of Governments (SCAG) launched a Compass Blueprint visioning program in 2000
- In 2004, the SCAG visioning program was developed with the following four key principles to guide future decision on development and growth:

  (1) mobility - getting where we want to go;

  (2) livability - creating positive communities;

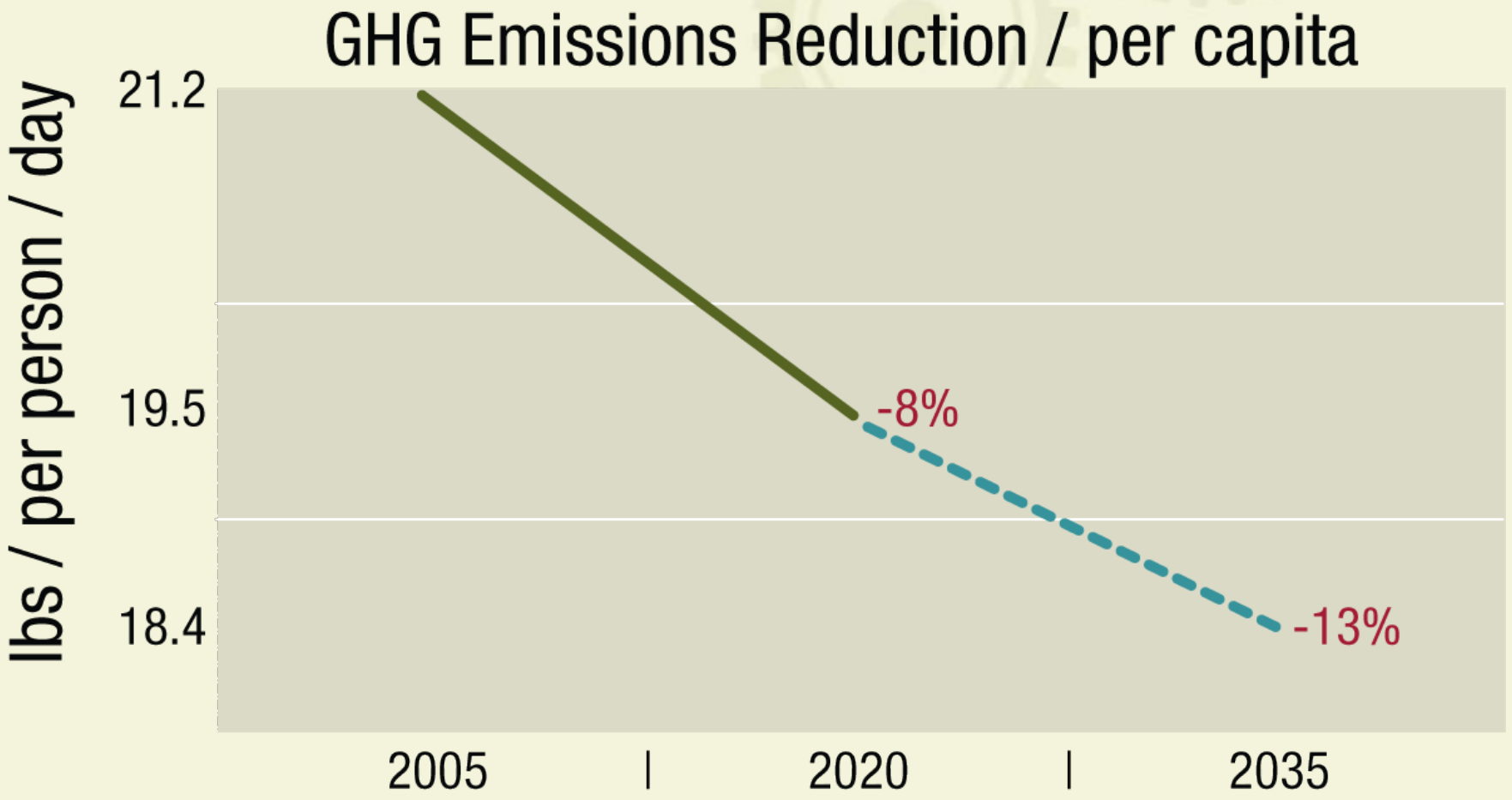
  (3) prosperity – maintaining the long-term health; and

  (4) sustainability - promoting the efficient use of natural resources

CA Senate Bill 375

- Became law in 2009
- Achieve specified GHG emission reduction targets in 2020 and 2035
  - from autos and light duty trucks
  - through land use and related policies
- Implement AB 32 (a small portion)
- Integrate RTP with other regional plans and processes
  - Sustainable Communities Strategy (SCS)
- Regional Housing Needs Assessment (RHNA)
- Offers CEQA streamlining provisions

GHG Targets for SCAG Region



Integrated Land Use Planning for Sustainable Development

Land Use Strategies

Outcomes & Benefit

- Jobs – Housing Balance
- Higher Density / Mixed-Use
- Pedestrian Friendly
- Transit Orientation
- Development Location, Type and Size
- Preservation of Resources Areas
  Increase Pervious Surfaces
- Industrial / Brownfield Conversion
- Improved Sense of Place

- More Transit & Walk/Bike Trips
- Fewer & Shorter Auto Trips
- Less VMT & Congestion
- More Affordable Housing
- Improved Air Quality
- Less Runoff / Better Water Quality
- Decreased Energy & Water Consumption
- Better Public Health

TOD & Greenhouse Gas Emission Reduction

- SB 375 promotes a Transit Priority Project (TPP) as an approach to reduce Greenhouse Gas (GHG) emissions in the Regional Transportation Plan (RTP)
- TPP requirements include high residential density (>20units/acre), mixed use, and close to major transit stops (in ½ mile) and high-quality transit corridors
- A TPP is generally considered as a TOD project

Transit-Oriented Communities (TOCs)

- SCAG Growth Vision program encourages TOD types of community development
- The larger growth is expected in both residential and commercial areas near major transit stations and other identified transit centers
- It is important for planners to monitor and assess the progress of the Vision program.
- Develop tools to assess the transportation/GHG impacts from TOC development

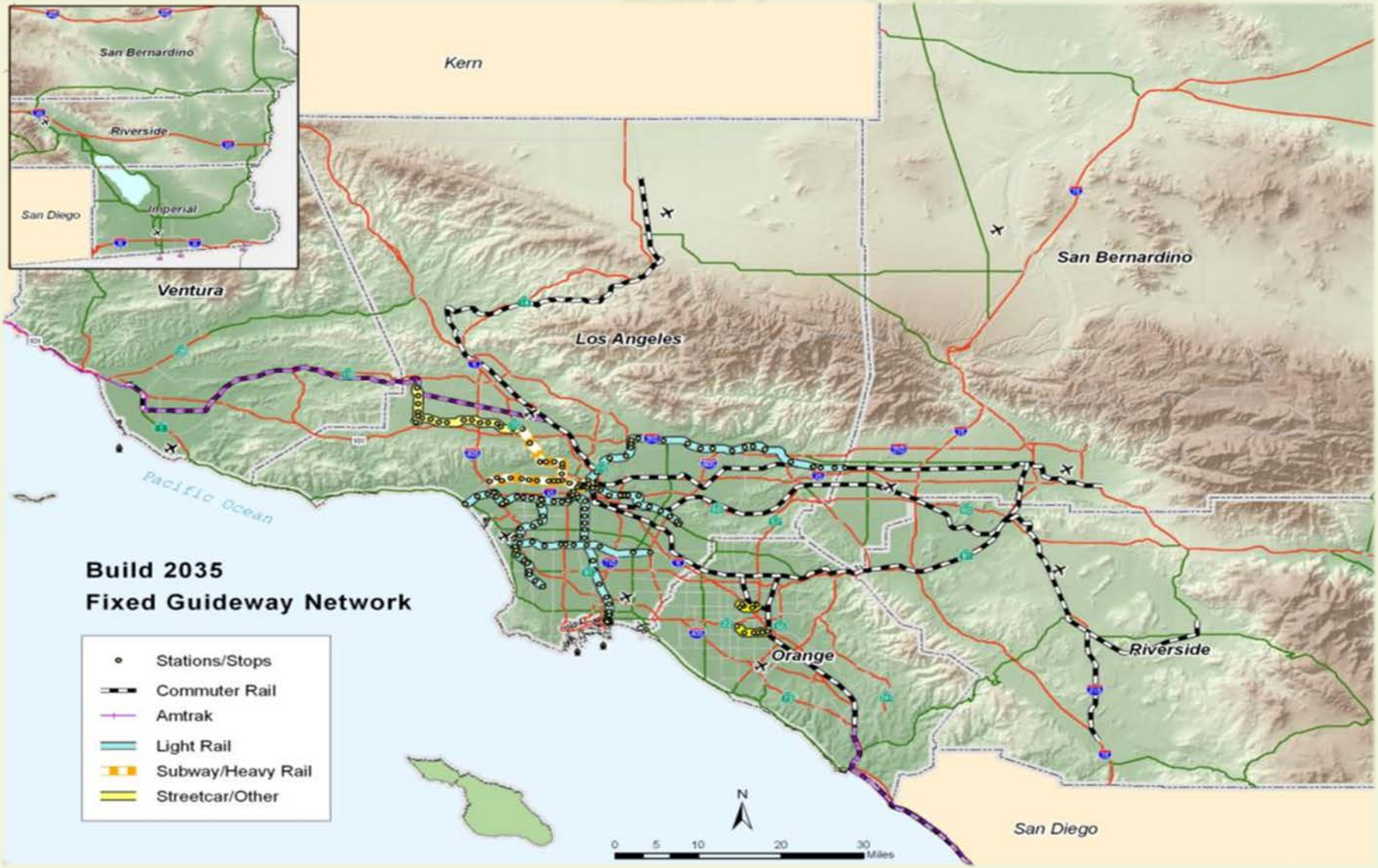
Challenges to Development Concentration

- Risk of gentrification (EJ/Title VI Analysis)
- Displace transit-dependent or core riders, including minorities and low-income residents
- Incompatible land uses within buffer areas near major roads, freeways & transit stations (EJ/Title VI)
- Reduce congestion/VMT/pollution at regional level but increase those at local level (EJ/Title VI)
- High development and infrastructure costs
- Community resistance

Rail Investment Condition in 1990

Rail Investment in 2010

Rail Investment in 2035



Questions

1. Will TOD work in Southern California?
2. How to monitor the performance of TOD project areas?
3. How to assess transportation/travel impacts from TOC development for both local and regional planning

Objective 1

- **Evaluate whether TOC areas are moving toward more desirable, sustainable, and livable communities and likely impacts**

Approach & Data

- Apply block group data procured from 2000 Census and 2005-09 ACS, and calculate a set of performance indicators for both TOC and the other areas.
- We demonstrate some trends between the two time periods to evaluate the effects of TOC areas

Objective 2

- **Understand social and travel characteristics of the households within the TOC areas**

Approach & Data

- Using a disaggregated data set procured from the 2009 National Household Travel Survey (NHTS), we analyzed interlinks among demographic, economic, and travel characteristics of the households who stay in TOC areas and in the SCAG region

Objective 3

- **Develop model to predict impacts on travel and transportation from TOC development**

  Approach & Data

- Using a disaggregated data set from the 2009 National Household Travel Survey (NHTS), develop statistical model to link “Ds” with various transportation and travel outcomes, such as auto ownership, vehicle trips, and VMT

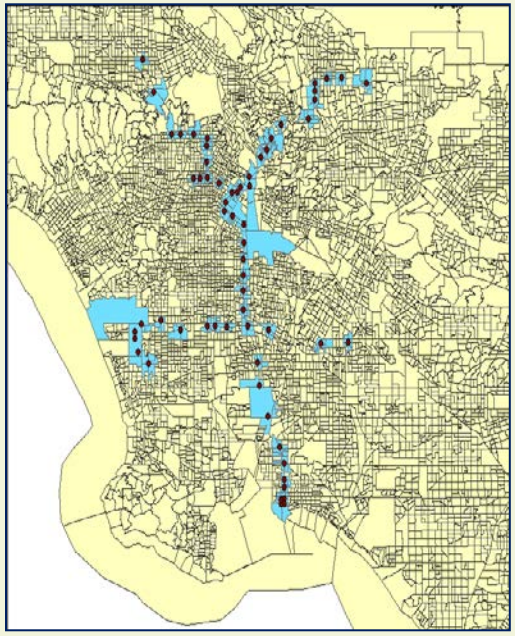
Performance Indicators

- Collect data for 125 Transit-Oriented Communities (TOC's)
- Performance indicators were developed for following five categories: (1) Growth, (2) Economies, (3) Sustainability, (4) Equity, and (5) Transportation

TOC's

- A half mile buffer zones of 125 commuter rail and urban rail stations
- The communities were Identified by Census block groups and NHTS households

TOC + TOD Areas



Growth

Population & Households

Census/ACS

- The growth rates of population and households in TOC areas were at least 10% higher than those in the entire SCAG region
- The households and population in the TOC areas share about 3-4% of the region

Total	**2000**	**05-09**	**% Growth**
Population	16,516,006	17,737,412	7.4%
Households	5,386,491	5,689,831	5.6%
TOC	**2000**	**05-09**	**% Growth**
Population	546,982	642,379	17.4%
Households	179,355	210,620	17.4%
TOC/Total	**2000**	**00-05**	**% Growth**
Population	3.3%	3.6%	9.4%
Households	3.3%	3.7%	11.2%

Economies

Income, Workers & Jobs

Census/ACS

- Median household income in the TOC areas was lower than the regional average. However, the growth rates for the workers and jobs in the TOC areas were faster than those in the entire region.
- The type of workers' occupation or employed industry may affect the economic indices

HH. Income	2000	05-09	% Growth
Region	50,855	49,015	-4%
TOC	32,728	33,262	2%
Workers	**2000**	**05-09**	**% Growth**
Region	6,810,823	8,082,681	19%
TOC	203,573	286,368	41%
Jobs	**2000**	**05-09**	**% Growth**
Region	6,661,287	7,193,159	8%
TOC	1,001,443	1,173,754	17%

Median household income was converted to $1999

Equity

% of Elderly & Hispanic Population

Census/ACS

- There is no dominant difference in age distribution (between the SCAG region and the TOC areas, and between the two time points).
- The share of Hispanic population is about 13% higher in the TOC areas than in the SCAG region.

SCAG		
% Age	2000	05-09
<5	7.8%	7.6%
5-15	17.8%	16.3%
16-64	64.4%	65.8%
>65	9.9%	10.4%
All	100.0%	100.0%
% Hispanic	40.6%	44.2%

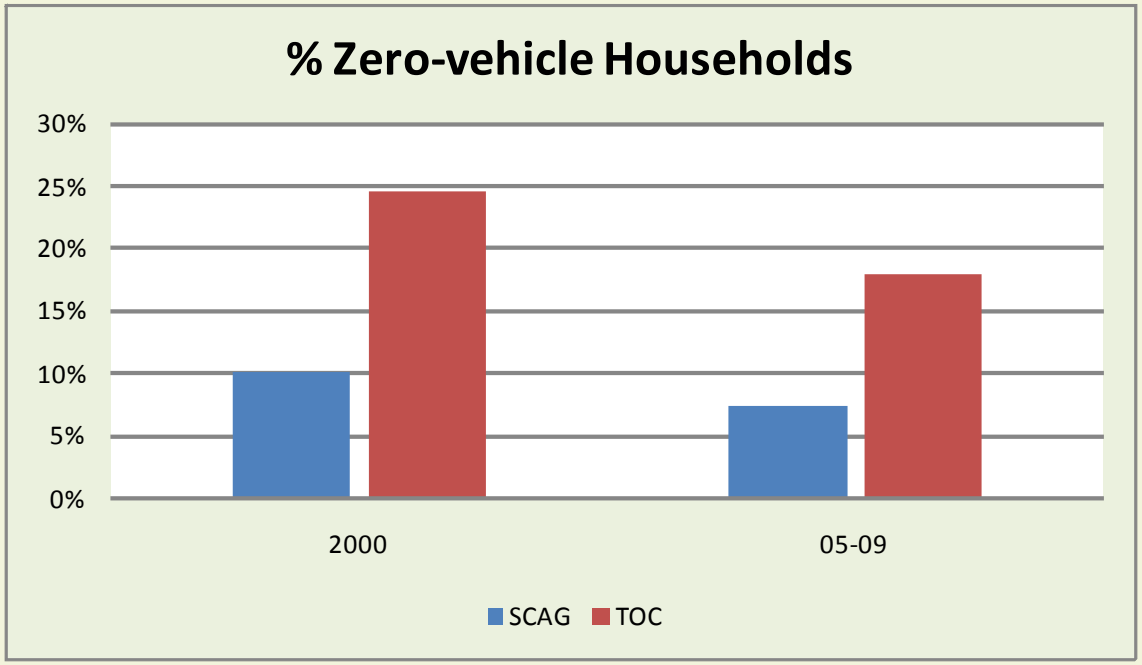
TOC		
% Age	2000	05-09
<5	8.5%	7.6%
5-15	17.6%	15.4%
16-64	65.0%	67.6%
>65	8.9%	9.4%
All	100.0%	100.0%
% Hispanic	54.0%	56.6%

Sustainability

Vehicle Use

Census/ACS

- The TOC areas demonstrated higher shares of zero-vehicle households than the SCAG region (although the share is much declining in the TOC areas).
- Average per household vehicles increased by 13% in the TOC areas and by 8% in the region.



Mean Difference

TOC vs. Non-TOC

Census/ACS

- ANOVA was applied to test the mean difference between 2000 and 2005-09 data:
- Major differences were highlighted with red colors using Turkey approach, and significant changes were found in vehicle use, density, and education related variables

Variable	Non-TOC	TOC	TOC+TOD	P-value
Percent change of High Educated People	0.0284	**0.0402**	**0.0520**	**
Percent change of 0 Vehicle Household	-0.0250	**-0.0625**	**-0.0926**	***
Percent change of Household in Rent	-0.0135	-0.0366	-0.0074	
Percent change of Unemployment rate	0.1800	0.1921	0.1920	
Percent change of Household Density	0.0386	**0.1358**	**0.4571**	*
Percent change of Employment Density	0.2675	**1.4235**	**1.1515**	***
Percent change of Hispanic population	0.0387	0.0211	0.0354	

P-value: * p<0.05; ** p<0.01; *** p<0.001

Mean Difference

by Rail Type

- Breaking down TOC by Rail Type: Urban Rail / Commuter Rail
- While TOC with Commuter Rail had a significant change in the number of households, TOC with Urban Rail demonstrated significant changes in vehicle use, employment density, and education related variables.

Description	Non-TOC	Urban Rail	Commuter Rail	P-value
Percent change of Hispanic population	0.0387	0.0216	0.0251	
Percent change of High Educated People	0.0284	**0.0511**	0.0227	***
Percent change of 0 Vehicle Household	-0.0250	**-0.0823**	-0.0336	***
Percent change of Household in Rent	-0.0135	-0.0453	-0.0088	
Percent change of Unemployment rate	0.1800	0.1828	0.2107	
Percent change of Household Density	0.0386	0.2467	0.0283	
Percent change of Employment Density	0.2675	**1.7512**	0.6743	***

P-value: * p<0.05; ** p<0.01; *** p<0.001

Transportation – NHTS Data

- There is no direct measure from Census or ACS to analyze transportation-related indicators
- Transportation System Information (TSI) of California Department of Transportation (Caltrans) supports 2009 NHTS California add-on data
- With about 6,700 households and 15,000 individual samples, the 2009 NHTS dataset provides valuable and sufficient observations to analyzing both demographic and travel characteristics of the SCAG region and the TOC areas.
- We analyze NHTS households with a quarter, a half, and one mile buffer zones from the 125 TOC stations.

TOC Household Characteristics

Households in the TOC areas demonstrated

- Smaller household size;
- Higher percentages of single-person households and households without kids; and
- More households with workers than in the SCAG region

	HHsize	% 1 person	% No Kids	% 1p HH, Retired	% 2p+ HH, Retired	% HH Workers
toc025	2.28	44.6	46.4	19.6	7.1	59%
toc050	2.60	35.6	38.3	16.3	13.6	52%
toc100	2.80	28.4	34.8	13.4	17.0	49%
SCAG	2.82	22.3	30.2	12.0	24.4	49%

TOC Travel Characteristics

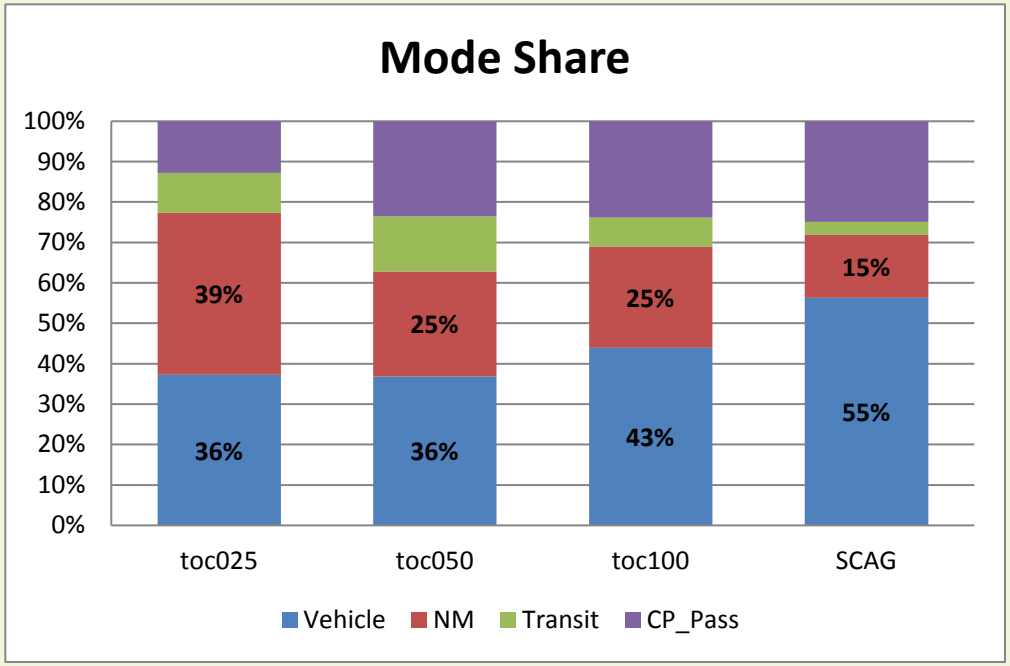
Households in the TOC areas show

- less traveled and less drove
- higher shared non-motorized and transit modes, and lower shared vehicle mode

.

Household Trips and Travel Distance

	Trips	Trip Dist	Veh. Trip	VMT
toc025	5.5	26.0	2.0	16.6
toc050	7.3	34.9	2.6	16.8
toc100	7.9	42.7	3.4	23.7
SCAG	8.5	57.5	4.7	35.9



TOC Travel Characteristics

Hispanic vs. Non-Hispanic

NHTS

- The share of Hispanic and non-Hispanic households in TOC is about 50-50
- Compared to non-Hispanic, Hispanic households have larger household size, and lower household income
- Compared to the SCAG region, both Hispanic and non-Hispanic population in TOC showed a similar pattern: less total trips and less VMT

Hispanic Status

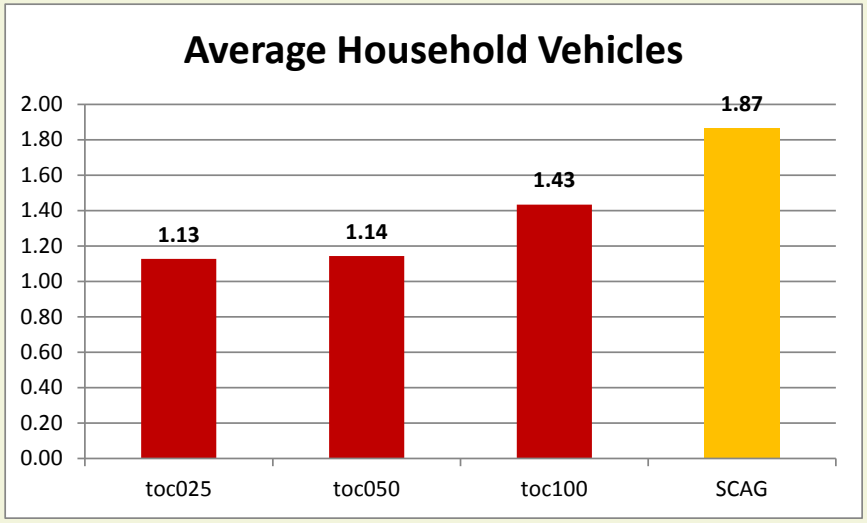
	% Household		Household Size		Household Income	
	Hisp	Non_Hisp	Hisp	Non_Hisp	Hisp	Non_Hisp
toc025	54%	46%	2.75	1.73	17,040	36,370
toc050	58%	42%	3.07	1.95	18,070	35,100
toc100	50%	50%	3.42	2.18	21,400	39,630
All	35%	65%	3.59	2.41	28,880	49,060

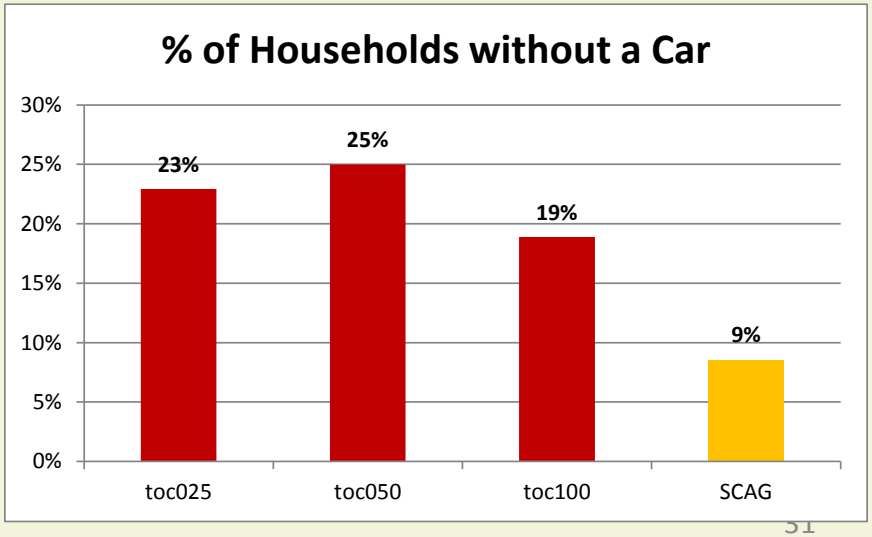
Daily Travel and VMT

	Trips		VMT	
	N-Hisp	Hisp	N-Hisp	Hisp
toc025	5.1	5.8	23.7	10.7
toc050	6.3	8.0	20.5	14.0
toc100	6.9	8.8	28.2	19.2
SCAG	7.9	9.6	38.8	30.5

Auto Ownership

- Compared to the SCAG Region, the TOC households had smaller number of vehicles.
- About 20% of the TOC households did not own a car; this is a double to that of the SCAG region.
- Vehicles are less available (or less needed?) in TOC households

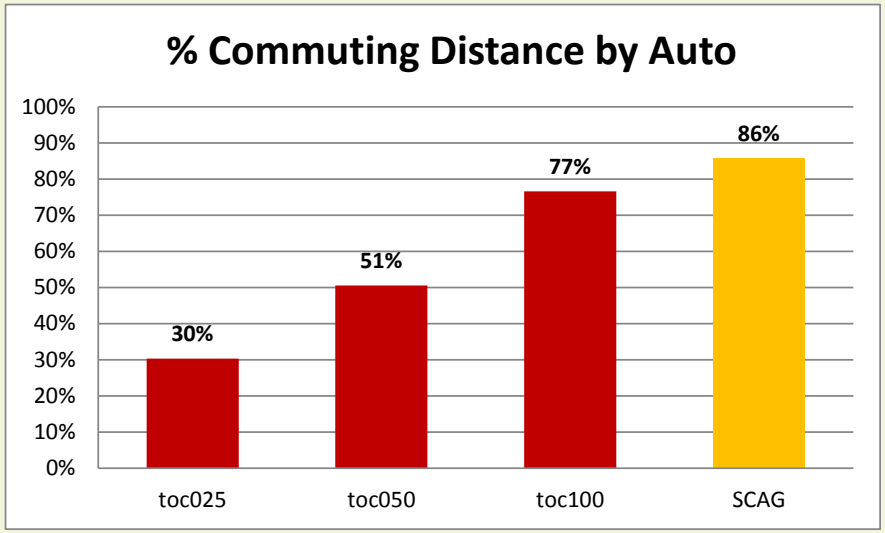




Commuting Distance by Auto

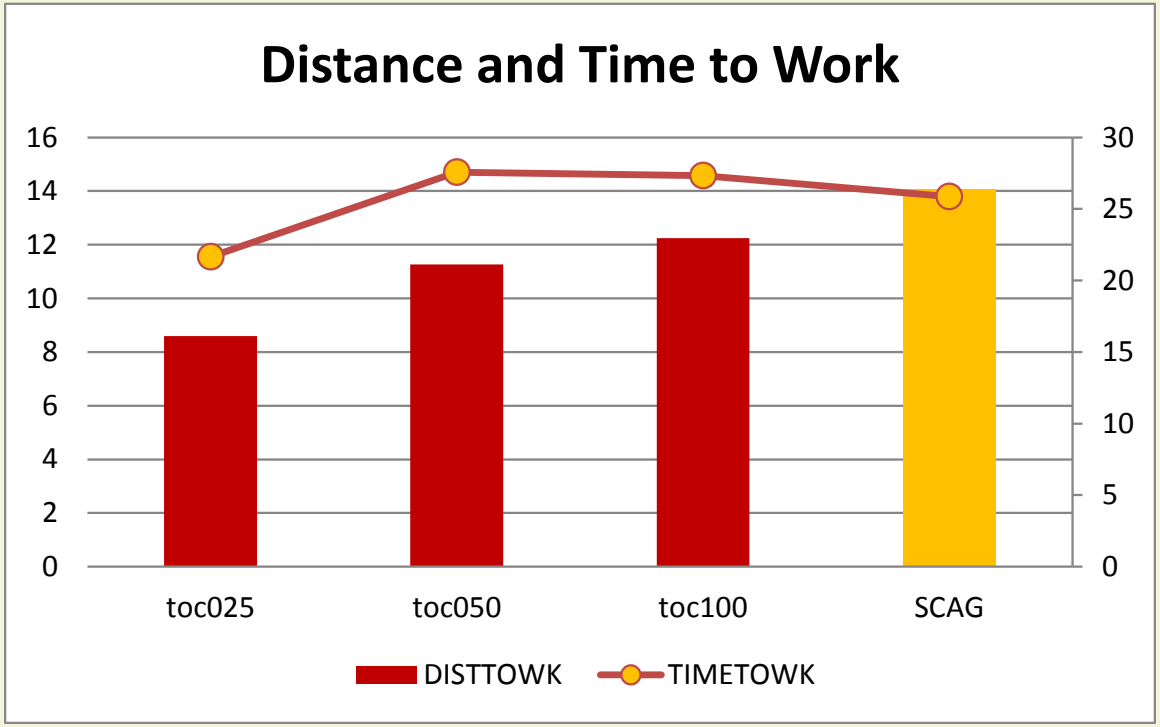
- Total commuting distance is shorter for TOC workers
- Commuting VMT is much shorter for the TOC workers than for the workers in the SCAG region
- Compared to 86% of the SCAG region, about a half of commuting distance were made by auto to the TOC workers
- Is it self-selected?

Home-Work Travel Distance		
	Vehicles	Total
toc025	4.1	13.6
toc050	9.7	19.2
toc100	16.5	21.5
SCAG	19.2	22.4



Commuting Distance and Time

- Living in higher density neighborhoods (TOC) induces a shorter commuting distance, while commuting time is almost same.
- Is it self-selected?



Model Analysis

- Using 2009 NHTS data, SCAG developed statistical models (Sustainability Tool) to analyze the impact of land use on VMT and travel
- The 3-tiered model includes 1) auto ownership model, 2) vehicle trip making model, and 3) VMT model
- We adjusted the model by adding a TOC dummy. The model results showed that the TOC dummy coefficient is significant.
- By applying SCAG 2008 data (current) and 2035 forecast data to the model, we tested the performance of TOC areas on VMT and other transportation indicators

Model Structure

Household Vehicle Ownership

NHTS

Household Vehicles Ownership						
Dependent Variable: hhcar2 = 0, 1, 2, 3+	R-Square	0.3998				
Linear Regression	Adj R-Sq	0.3986				
Variable	Variable	Estimate	S.Error	Inflation	Pr > |t|	Inflation
Constant	Intercept	0.95	0.03	28.56	<.0001	0.00
TOC dummy (in 1/2 mile)	toc050	-0.16	0.05	-3.21	0.00	1.11
# Household Workers	wker	0.44	0.01	36.89	<.0001	1.74
Number of HH non-workers, 0-15	nw0015	0.02	0.01	1.42	0.16	1.10
Number of HH non-workers, 16-64	nw1664	0.35	0.01	25.37	<.0001	1.26
Number of HH non-workers, 64+	nw6500	0.29	0.02	18.02	<.0001	1.67
Family Income (converted from dollar value $08 to $00)	inc10K	0.09	0.00	26.72	<.0001	1.41
Log of gross househod density of 1/4 mi buffer	LGRSHH	-0.02	0.01	-3.93	<.0001	1.39
High Residential density Dummy * density	DH_Hden	-0.07	0.02	-3.50	0.00	1.08
Log of gross employment density of 1/4 mi buffer	LGRSEMP	-0.02	0.00	-3.05	0.00	1.30
Connect / Walkability	WalkaInx1	0.00	0.00	-2.86	0.00	1.55
Regional accessibility - % of regional jobs accessed in auto 30 mins	Dlbushq	-0.25	0.04	-6.65	<.0001	1.19
Regional accessibility - % of regional jobs accessed in auto	TEPKauto	-0.53	0.15	-3.41	0.00	1.36
Proportion of Hispanic Population	P_HISP08	-0.09	0.04	-2.15	0.03	1.29

Model Structure

Household Vehicle Trip Making

Household Vehicle Trip Making Model					
Binary Logistic Model		Somer's D	0.666		
Dependent Variable: DA = 0, 1		Gamma	0.668		
		Tau-a	0.189		
		c	0.833		
Variables	Variables	Estimate	Error	Standard Chi-Square	Wald Pr > ChiSq
Constant	Intercept	-0.79	0.17	20.54	<.0001
TOC dummy (in 1/2 mile)	toc050	-0.52	0.21	6.02	0.01
# Household Workers	wker	1.20	0.10	144.90	<.0001
Number of HH non-workers, 0-15	nw0015	0.15	0.09	2.97	0.08
Number of HH non-workers, 16-64	nw1664	0.34	0.09	14.34	0.00
Number of HH non-workers, 64+	nw6500	0.50	0.09	29.59	<.0001
Family Income (converted from dollar value $08 to $00)	inc10K	0.08	0.02	14.39	0.00
Household Vehicles	hhcar2	0.86	0.07	162.61	<.0001
Log of gross househod density of 1/4 mi buffer	LGRSHH	-0.07	0.04	3.55	0.06
High Residential density Dummy * density	DH_Hden	-0.21	0.09	5.81	0.02
Connect / Walkability	WalkaInx1	-0.01	0.00	6.49	0.01
Proportion of Hispanic Population	P_HISP08	-0.78	0.20	14.69	0.00

Model Structure

Household VMT

Household VMT (for HH making more than one VT)					
Dependent Variable: autovmt				R-Square	0.243
Linear regression				Adj R-Sq	0.2407
Variable	Estimate	S.Error	Inflation	Pr > |t|	Inflation
Intercept	11.83	2.65	4.46	<.0001	0.00
toc050	1.19	4.39	0.27	0.79	1.10
wker	16.18	0.98	16.49	<.0001	1.98
nw0015	2.15	0.96	2.25	0.02	1.09
nw1664	8.26	1.08	7.67	<.0001	1.38
nw6500	2.18	1.23	1.77	0.08	1.69
inc10K	1.75	0.26	6.81	<.0001	1.45
hhcar2	7.36	1.02	7.18	<.0001	1.50
LGRSHH	-1.72	0.40	-4.30	<.0001	1.09
DH_Hden	-0.83	1.87	-0.44	0.66	1.04
Dlbushq	-4.79	3.34	-1.43	0.15	1.18
TEPKauto	-85.00	11.31	-7.51	<.0001	1.18
P_HISP08	-5.29	3.28	-1.62	0.11	1.27

Model Results

- According to the preliminary results, the TOC areas will experience significant reductions in household vehicle ownership and VMT per household, but increase in the transit use.
- At the same time, the percentage of walking may be slightly reduced. (Model did not show)

Model Results between 2008 - 2035 (TOD Scaenario)

	Car/HH	VMT/HH	% Walking	% Transit
SCAG	1%	-1%	-3%	4%
TOC (2008)	-11%	-17%	-5%	24%

% Walking: Probability to make at least one walk trip

% Transit: Probability to make at least one transit trip

Conclusions

- The key question of the study was whether the TOC areas are moving toward more desirable, sustainable, and livable communities to live?
- The analysis using Census/ACS has demonstrated significant but small changes in household growth and land use density.
- The NHTS and econometric analyses have shown that the TOC areas may contain some significant benefits to the SCAG region (shorter commute, less rely on vehicle, more transit use, …).
- It will be interesting to know how demographic change at TOC (e.g., gentrification) will affect travel pattern.

Thank you!

Frank Wen, Ph.D.
Southern California Association of Governments
hu@scag.ca.gov

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www.scag.ca.gov